AW

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/678,444	10/01/2003	Jun Zeng	90065.000451/17732.6360.0	1591

34799 7590 06/10/2004

THOMAS R. FITZGERALD, ESQ.
16 E. MAIN STREET, SUTIE 210
ROCHESTER, NY 14614-1803

EXAMINER	
ABRAHAM, FETSUM	
ART UNIT	**PAPER NUMBER**
2826	

DATE MAILED: 06/10/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

AM

Office Action Summary	Application No.	Applicant(s)
	10/678,444	ZENG, JUN
	Examiner	**Art Unit**
	Fetsum Abraham	2826

-- The MAILING DATE of this communication app ars on the cov r sh et with th correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.
2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.
3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 14-22 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5)☐ Claim(s) _____ is/are allowed.
6)☒ Claim(s) 14-22 is/are rejected.
7)☐ Claim(s) _____ is/are objected to.
8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.
10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a)☐ All b)☐ Some * c)☐ None of:
1.☐ Certified copies of the priority documents have been received.
2.☐ Certified copies of the priority documents have been received in Application No. _____.
3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 19 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 19 recites the limitation "the third layer" in 14. There is insufficient antecedent basis for this limitation in the claim.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 14-18,20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Baliga (5,998,833).

The patent discloses a vertical MOSFET structure in the front page having a heavily doped substrate (114) of first conductivity type material used as the drain of the structure, a lightly doped first conductivity epitaxial layer (112) on the substrate, implanted second conductivity type layer (116) on the epitaxial layer, making a trench by masking the substrate portion of the anticipated trench and removing material through the exposed portion, growing oxide liner (125) inside the trench covering all sides of the trench, and diffused walls of the second conductivity type (116) (the structure in 4B shows the wells more precisely), upper and lower conductors (127,128) inside the trench and separating both by the insulating material in the trench, and source regions (118) of first conductivity material on the surface. Although then prior art may have omitted to teach that the structure reduces Miller capacitance and may have alternately used diffusion and implantation to form the layers, it would have been obvious to one skilled in the art to expect the structure function similar to the claimed invention because of structural similarity. Further, it would also have been obvious to one skilled in the art to diffuse or implant the layers alternately since the two methods are the most common in the art of making semiconducting structures.

As for claim 15, the source electrode (128b) covers a portion of the substrate.

As for claim 16, since the source regions (118) and the source electrode are on the top of the substrate and a source region is defined by the lower electrode inside the trench it is clear that the three elements must be in electrical contact for the MOSFET to function properly. The contact could only be made proximate to the periphery of the device since there is no direct contact made between the layers through the trench in the structure.

As for claims 17,18, the selection of dopant types is a function of the desired type of MOSFET, whether the MOSFET is a P type or an N type. Clearly, both types are MOSFETs are exchangeable in the art.

As for claim 20, nitrides and oxides are again known dielectric materials in the art and exchangeable in nature depending on desired capacitance and out-diffusion issues. Therefore, it would have been obvious to one skilled in the art to use either of the materials based on the anticipated performance of the structure. Exchanging one for the other is not patentable since it is a common practice in the art.

Claims 21,22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Baliga (5,998,833) in view of Kawakami et al (5,929,482).

The prior art might have omitted to show an interlayer dielectric above said second conductive layer which is also the upper surface of the structure in terms of position, but the secondary reference does show the layer in trench gate structures (see the front page figure and element (8)). Therefore, it would have been obvious to one skilled in the art to use such a layer in the structure of Baliga, since it protects the structure from external intervention and from structural damages.

As for claim 22, the interlayer insulation could be any insulator known in the art including the claimed material. Please note that silicate glass is a notoriously known material for such purposes because it provides better protection strength and fulfills the transparency requirement of dielectric materials.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fetsum Abraham whose telephone number is 703-305-3793. The examiner can normally be reached on 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Flynn Nathan can be reached on 703-308-6601. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Fetsum Abraham//6/2/04